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June, 1967

Dear Member,

Because the ultimate advantage of an electronic digital computer is its capability to perform mathematical operations rapidly and with a high degree of reliability, the key problem in utilizing this advantage lies in guiding the computer in its work. The solution to this is not, as might be expected, in knowing what controls to operate, but in analyzing a problem mathematically and in preparing a list of instructions (the program) for presentation to the computer.

This month's Main Selection is a highly useful work that will help every user of a computer to achieve that end:

MATHEMATICAL METHODS FOR DIGITAL COMPUTERS, VOLUME 2

Edited by Anthony Ralston and Herbert S. Wilf

Since the appearance of Volume 1 of MATHEMATICAL METHODS OF DIGITAL COMPUTERS several years ago, advances in the field of numerical analysis have come at a breathtaking rate--so rapidly that another volume has been needed to represent in depth some of these changes as well as to fill in the gaps in the coverage of the first volume.

Volume 2 of this important work has now made its appearance and continues the extremely useful format of the first volume. The opening chapter is devoted to a highly lucid study of ALGOL and FORTRAN (with emphasis on their structure as formal algorithmic languages and on the differences between them) and serves to familiarize the reader with the concept of an algorithm and with algorithmic notation.

It also serves as a solid foundation for the twelve subsequent chapters, each of which is devoted to selected topics in numerical analysis and follows a standardized--and very practical--format:

* First the function of each method is described
* A mathematical discussion of the problem to be solved follows
* A sequence of steps to carry out the solution of the problem is given

(continued on back page)

This Month's Main Selection

Mathematical Methods for Digi

VOLUME 2

Edited by Anthony Ralston, Ph.D. and Herbert S. Wilf,
Professor of Mathematics and Director of Computing Center
State University of New York at Buffalo
Professor of Mathemati
The University of Penns

Outstanding features of this new second volume include

- important problems of numerical analysis are treated in a v integrated way—covering all aspects from conception up to act ing for the machine
- contributions by world-renowned leaders in the field
- written specifically for users of digital computers
- a standardized format in virtually every chapter
- broad coverage in each chapter: from mathematical analysis calculation procedure, flow chart, sample problem, etc.

From the Preface . . .

"The few years since the appearance of the first volume of this work have seen a continuation of the dynamic progress which has characterized numerical analysis in the postwar era. New methods, new understanding of old methods, new equipment, and new computer languages have led us to the preparation of this second volume. In it we have retained what we believe to have been the main strengths of the first volume.

"First, our philosophy has been to carry a problem from the mathematics as far as possible toward a computer program while preserving independence of particular machines. In the earlier volume this process halted at the flow chart. In this volume, however, we have been able to include programs when they are not excessively long.

"The programs are all in FORTRAN, which reflects our bias that, while ALGOL may be an official publication language of the computing community, FO and used by the large ma 1 the reader will find a guages which, although ALGOL, is unlikely to

"Otherwise, the form the first volume. The onl the Memory Requireme than in the previous vo This permits a greater feel is all to the good.

"Our invited contribu have, themselves, made discuss, and they have fu for depth of discussion.'

Contents and Contributors

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dispassionate comparison of the two lan-
it may convince him of the superiority of
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y significant difference is the elimination of
its section. There are fewer chapters here
ume, but their average length is greater.
epth of mathematical discussion, which we

tors are outstanding research workers who
mportant discoveries in the fields that they
lly availed themselves of their opportunities

Main Selection

Mathematical Methods for Digital Computers

VOLUME 2

Edited by Anthony Ralston and Herbert S. Wilf

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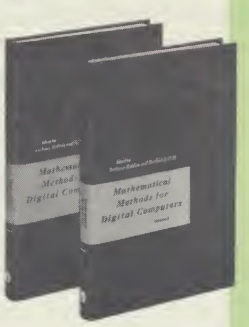

Alternate Selection

Introduction to ALGOL

by R. Baumann, F. L. Bauer, and K. Samelson,
Munich Institute of Technology
and M. Feliciano,
Mathematics Division
Oak Ridge National Laboratory

ALGOL (ALGebraic Oriented Language) arose out of a continuing international effort to develop a "common language" for automatic programming in computational applications. In this definitive volume, you will find a complete and careful exposition of all the techniques necessary to write clear and accurate ALGOL programs for a wide range of applications.

For practical convenience, INTRODUCTION TO ALGOL is divided into three sections:

Part I deals with the most fundamental aspects of ALGOL; covers symbols, arithmetic expressions, program construction, loops, conditional statements, jumps and labels.

Part II extends the formal language of ALGOL: introduces elements—such as block structure, propositions, and designational expressions—for handling complex computational processes.

Part III explains advanced concepts of ALGOL: uses of expressions called by name, and procedures calling themselves.

Throughout the book, emphasis is on normal use of ALGOL rather than implausible possibilities of limited practical value. Fully worked out examples and exercises bring out basic concepts of the text and demonstrate good programming techniques. All special terms are clearly defined as they occur, and the book follows a natural development which eliminates unnecessary repetition.

From basic symbology to working procedures, INTRODUCTION TO ALGOL gives you everything you need to know to put this powerful programming tool to full use in your computer applications. Furthermore, like ALGOL itself, this book is the product of considerable refinement and simplification, the outgrowth of actual experiences using, compiling, and teaching ALGOL both in Europe and the United States.

Publisher's Price $7.50

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* Detailed flowcharts and their descriptions are presented

* Programs in FORTRAN and required subroutines are outlined

* A representative sample problem in worked out

* Running time estimates are given

* Detailed literature references are listed for additional reading

The thirteen individual chapters by outstanding authorities (who have made significant contributions in their fields) are divided among six separate parts:

* Programming Languages
* The Quotient-Difference Algorithm
* Numerical Linear Algebra
* Numerical Quadrature and Related Topics
* Numerical Solution of Equations
* Miscellaneous Methods

The programs given are all in FORTRAN, reflecting the editors' bias that, while ALGOL may be an official publication language of the computing community, FORTRAN is the language known and used by the persons who will use this book.

MATHEMATICAL METHODS FOR DIGITAL COMPUTERS, VOLUME 2, not only comprises a significant survey of today's newest numerical methods, but it acquaints the reader with the interplay between computer abilities and the process of analysis. Each chapter takes a problem from its formulation up to, but not including, the actual coding for a digital computer. And the usefulness of this book is increased because no reference is made to particular types of computers or their specific coding requirements.

The noted mathematician R. W. Hamming has said, "The purpose of computing is insight, not numbers." MATHEMATICAL METHODS FOR DIGITAL COMPUTERS will assist every user of a computer to take advantage of the powerful tool that is numerical analysis--as adapted for programming on an electronic digital computer.

For members of The Library of Computer and Information Sciences who may have missed the first volume of this important work, a special offer brings both volumes at even greater savings.

Sincerely yours,

Martin Reynolds

Martin Reynolds
Executive Director

Contents of **Martin Gardner's New Mathematical Diversions from Scientific American**

Contents of **536 Puzzles & Curious Problems**

MARTIN GARDNER'S NEW MATHEMATICAL DIVERSIONS FROM SCIENTIFIC AMERICAN and 536 PUZZLES & CURIOUS PROBLEMS comprise a Special Selection of The Library of Computer and Information Sciences.

TWO NEW BOOKS ON MATHEMATICAL DIVERSIONS WITH MARTIN GARDNER

This month's Special Selection might appropriately be called "a Martin Gardner festival." It is made up of two new books, compiled and edited by the distinguished author and editor of the Mathematical Games Department of *Scientific American.*

"A good mathematical joke," wrote the British mathematician John Edensor Littlewood in the introduction to his *Mathematics Miscellany,* "is better, and better mathematics, than a dozen mediocre papers." It was not for amusement alone that Kepler, Pascal, Fermat, Leibniz, Euler, Lagrange, Hamilton, Cayley and many others devoted so much time to mathematical jokes and puzzles.

The first half of this month's Special Selection, MARTIN GARDNER'S NEW MATHEMATICAL DIVERSIONS FROM SCIENTIFIC AMERICAN, is a book of mathematical jokes, if "joke"is taken in a sense broad enough to include any kind of mathematics that is mixed with a strong element of fun.

In twenty chapters expanded from the rich cream of twenty columns in *Scientific American* and with much *new* material added, Martin Gardner presents a broad spectrum of delightful mathematical diversions:

- ☐ You can construct a computer from 32 ordinary 3-by-5 file cards. With it you can unscramble a message, guess a selected number or solve logic problems.
- ☐ You will understand group theory by braiding your truelove's hair in an unusual game originally devised by the Danish mathematician Piet Hein.
- ☐ Expand your mathematical ingenuity by solving 28 brain teasers, including a railroad switching puzzle that demonstrates a type of problem posed in operations research.
- ☐ Prove the four-color map theorem and grasp topological theory.
- ☐ Using rubber cement and table-tennis balls, solve problems of packing spheres.
- ☐ Confirm the Pythagorean Theorem with paper and scissors.
- ☐ Use the calculus of finite differences to slice a cheesecake or the crescent moon.
- ☐ Play Lewis Carroll's game of *Doublets*
- ☐ Learn two long-forgotten games revived by Martin Gardner: *Reversi,* a Victorian game played with sixty-four pieces on an ordinary checkerboard, or *Rithomomachy,* the great medieval number game; also *Hip* (so named because of the hipster's reputed disdain for "squares"); *Oriental Chess, Fairy Chess, Bridg-it; Halma;* and many more.

This is only a small fraction of the incomparably rich collection of mathematical divertissements to be found in MARTIN GARDNER'S NEW MATHEMATICAL DIVERSIONS FROM SCIENTIFIC AMERICAN.

Complementing this lucid, graceful, witty, and always interesting collection of new material is another delightful volume, 536 PUZZLES & CURIOUS PROBLEMS, by Henry Ernest Dudeney, who has rightly been called "the puzzle king."

Containing almost the entire contents of two of Dudeney's best books, *Modern Puzzles* and *Puzzles and Curious Problems* (which have long been out of print and difficult to obtain), this just-published volume has been edited and supplied with an introduction by Martin Gardner.

Henry Ernest Dudeney, born at Mayfield, in Sussex, in 1857, was a self-taught mathematician who never attended college. For two decades, his puzzle page, "Perplexities," which he illustrated, ran in *The Strand Magazine.*

Geometrical dissections – cutting a polygon into the smallest number of pieces that can be refitted to make a different type of polygon – was a field in which Dudeney was unusually skillful. 536 PUZZLES & CURIOUS PROBLEMS contains many surprising, elegant dissections that Dudeney was the first to obtain.

He was also an expert on magic squares and other problems of a combinatorial nature, being the first to explore a variety of unorthodox types of magic squares, such as prime number squares and squares magic with respect to operations other than additions. (Dudeney was the author of the excellent article on magic squares in the fourteenth edition of the *Encyclopedia Britannica.*)

In recreational number theory, he was the first to apply "digital roots"– the term was probably coined by him – to numerous problems in which their application had not been previously recognized as relevant.

Stories about Dudeney and his dry wit are legion. His daughter recalls that the family had a mongrel terrier whose name, for some obscure reason, was Chance. One day Dudeney fell over the dog's leash and broke his arm. His comment — made without anger — was a quotation: "Chance is but a direction thou canst not see."

Another anecdote concerns a code message that appeared in the "agony column" of a London newspaper. In it a man asked a girl to meet him without her parents knowing about it. Dudeney cracked the code, then placed in the same column a coded message to the girl in the identical cipher, that said, "Do not trust him. He means no good. Well Wisher." This was followed by a code message from the girl to "Well Wisher," thanking him for his good advice.

In 536 PUZZLES & CURIOUS PROBLEMS, Martin Gardner has rearranged and reclassified the puzzles but has only minimally edited the text. British words such as "petrol" have been changed to their American equivalents; long paragraphs have been broken into shorter ones for easier reading; and in problems about money, American currency has been substituted for British.

The 421 illustrations all reproduce the charming original drawings. Footnotes and comments have been added by the editor to point out minor errors or to show how an answer has been improved or a problem extended by later enthusiasts of recreational mathematics. Dudeney's long out-of-print books thus become a rich new source of unusual problems, many of them leading into fascinating regions of mathematics yet to be fully explored.

MARTIN GARDNER'S NEW MATHEMATICAL DIVERSIONS FROM SCIENTIFIC AMERICAN and 536 PUZZLES & CURIOUS PROBLEMS amply demonstrate the truth of Leibniz's statement, in a letter to Pascal: "Man has never shown more ingenuity than in his games." Better than any other branch of mathematics, mathematical diversions reflect its always youthful, unspoiled and inquiring spirit. Mathematical puzzles are made of the things that the mathematician, no less than the child, plays with and dreams and wonders about, for they are made of the things and circumstances of the world in which he lives.

Special Selection

Martin Gardner's New Mathematical Diversions from Scientific American

and

536 Puzzles & Curious Problems

by Henry Ernest Dudeney □ Edited by Martin Gardner

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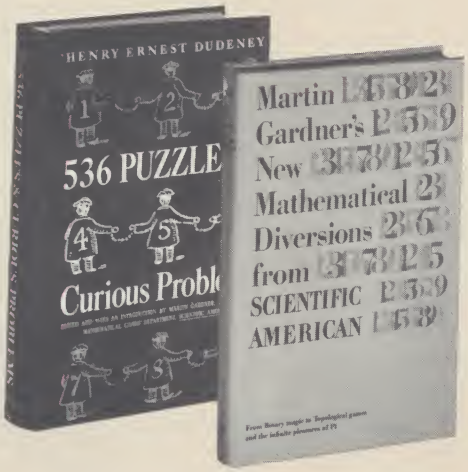

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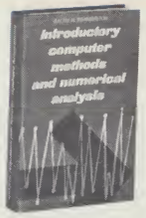

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